

WHAT IS CLAIMED IS:

1. A process that comprises forming a pressurized, molten mixture of a
5 melt-processable polylactide (PLA) resin containing about 3 to about 15% by
weight, based on the weight of the PLA resin, of carbon dioxide, and extruding the
molten mixture at an extrusion temperature through a die to a region of reduced
pressure such that the carbon dioxide expands and the PLA resin simultaneously
cools to form a stable foam.
- 10 2. The process of claim 1, wherein the PLA resin contains at least 80%
by weight polymerized lactic acid units.
3. The process of claim 2, wherein the PLA resin contains at least 99%
15 by weight polymerized lactic acid units.
4. The process of claim 2, wherein the lactic acid repeating units are a
mixture of L- and D- enantiomers.
- 20 5. The process of claim 4, wherein the PLA resin is amorphous.
6. The process of claim 5, wherein the mixture of L- and D-
enantiomers includes from about 85-96% by weight of one enantiomer and about
4-15% by weight of the other enantiomer.
- 25 7. The process of claim 5, wherein the extrusion temperature is from
from about 80 to about 120°C.
8. The process of claim 1, wherein the molten mixture is formed under
30 conditions such that the carbon dioxide is a supercritical fluid, and the molten
mixture is maintained under such supercritical conditions until it reaches the die.

9. The process of claim 7, wherein the PLA resin contains about 5 to about 13.5% by weight CO₂.

19. The process of claim 2 wherein the PLA resin further contains a
5 nucleating agent.

11. The process of claim 7 wherein the PLA resin further contains a
nucleating agent.

12. The process of claim 2 wherein the PLA resin contains long-chain
10 branching.

13. The process of claim 12 wherein the PLA resin is the reaction
product of a linear PLA resin and a polyfunctional branching agent having
15 reactive groups that react with hydroxyl or carboxyl end groups on the linear PLA
resin.

14. The process of claim 5, comprising the further step of heat treating
the foam to induce crystallinity.

20

15. A process that comprises forming a pressurized, molten mixture of a
melt-processable amorphous polylactide (PLA) resin and carbon dioxide, adjusting
the temperature of the mixture to a temperature above its solidification
temperature but not above 120°C, and extruding the molten mixture through a die
25 to a region of reduced pressure such that the carbon dioxide expands and the PLA
resin simultaneously cools to form a stable foam.

16. The process of claim 15, wherein the molten mixture is formed
under conditions such that the carbon dioxide is a supercritical fluid, and the
30 molten mixture is maintained under such supercritical conditions until it reaches
the die.

17. The process of claim 15, comprising the further step of heat treating the foam to induce crystallinity.

18. A PLA foam made according to the process of claim 1, having a density of from about 1 to about 17 pounds per cubic foot (16-272 kg/m³).

19. A PLA foam made according to the process of claim 5, having a density of from about 1 to about 17 pounds per cubic foot (16-272 kg/m³).

20. A PLA foam made according to the process of claim 7, having a density of from about 1 to about 17 pounds per cubic foot (16-272 kg/m³).

21. A PLA foam made according to the process of claim 15, having a density of from about 1 to about 17 pounds per cubic foot (16-272 kg/m³).

22. A PLA foam made according to the process of claim 16, having a density of from about 1 to about 17 pounds per cubic foot (16-272 kg/m³).

23. A PLA foam made according to the process of claim 17, having a density of from about 1 to about 17 pounds per cubic foot (16-272 kg/m³).

24. An extruded foam of a polylactic acid resin having lactic acid repeating units that are a mixture of L- and D- enantiomers, wherein the mixture of L- and D- enantiomers includes at least 4% of each enantiomer, and wherein the foam has a crystallinity of at least 10 J/g, as measured by differential scanning calorimetry.

25. The extruded foam of claim 24, wherein the mixture of L- and D- enantiomers includes 86-95% of one enantiomer and 5-14% of the other enantiomer, and the crystallinity of the foam is about 13-24 J/g.